

**PCT****INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>20021993 WO</b>	<b>FOR FURTHER ACTION</b> See Form PCT/IPEA/416																									
International application No. <b>PCT/FI 2003/000829</b>	International filing date (day/month/year) <b>06.11.2003</b>	Priority date (day/month/year) <b>07.11.2002</b>																								
International Patent Classification (IPC) or national classification and IPC <b>C25C 7/02, C25C 1/16</b>																										
Applicant <b>Outokumpu Oyj et al</b>																										
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>4</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>3</u> sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <table> <tbody> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </tbody> </table>			<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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Date of submission of the demand <b>19.05.2004</b>	Date of completion of this report <b>25.01.2005</b>
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## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI 2003/000829

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

This report is based on a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of:

- international search (under Rules 12.3 and 23.1(b))
- publication of the international application (under Rule 12.4)
- international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

the international application as originally filed/furnished  
 the description:

pages 1-8 \_\_\_\_\_ as originally filed/furnished  
 pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_  
 pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

the claims:  
 pages \_\_\_\_\_ as originally filed/furnished  
 pages\* \_\_\_\_\_ as amended (together with any statement) under Article 19  
 pages\* 9-11 \_\_\_\_\_ received by this Authority on 22-10-2004  
 pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

the drawings:  
 pages 1 \_\_\_\_\_ as originally filed/furnished  
 pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_  
 pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3.  The amendments have resulted in the cancellation of:

- the description, pages \_\_\_\_\_
- the claims, Nos. \_\_\_\_\_
- the drawings, sheets/figs \_\_\_\_\_
- the sequence listing (*specify*): \_\_\_\_\_
- any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- the description, pages \_\_\_\_\_
- the claims, Nos. \_\_\_\_\_
- the drawings, sheets/figs \_\_\_\_\_
- the sequence listing (*specify*): \_\_\_\_\_
- any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI 2003/000829

**Box No. V** Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	<u>1-18</u>	YES
	Claims	_____	NO
Inventive step (IS)	Claims	<u>1-18</u>	YES
	Claims	_____	NO
Industrial applicability (IA)	Claims	<u>1-18</u>	YES
	Claims	_____	NO

## 2. Citations and explanations (Rule 70.7)

This statement is based on the claims 1-18 filed with the letter of October 10, 2004.

## Documents cited in the International Search Report:

- D1: US 4 015 099 A (WILLIAM SENIUK ET AL)
- D2: US 2 790 656 A (L.A. COOK)
- D3: EP 0 376 447 A1 (ZIMCO INDUSTRIES (PROPRIETARY) LIMITED)
- D4: GB 2 252 569 A (BICC PUBLIC LIMITED COMPANY)
- D5: DE 3 323 516 A1 (HAPAG-LLOYD WERFT GMBH)

D1 discloses a process for fixing a Cu contact button to the Al or Al alloy conductor bar of an electrode plate. The process comprises (a) coating the Cu button with a thin layer of Ag; (b) mechanically screwing the Cu button in the conductor bar; (c) pre-heating the assembly; (d) welding the Ag-coated Cu button to the Al bar. The solid mechanical joint obtained by screwing is thus being reinforced by a strong metallurgical bond with a low electrical contact resistance.

D2 describes a method of joining aluminium to copper or steel especially in the joint of an electrode. In order to achieve a joint having good electroconductivity and mechanical strength, copper or steel member has been proposed to coat with tin or a mixture of tin before spot welding. However, this results in low mechanical properties and high electrical resistance.

D3-D5 represent less relevant prior art.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

The documents do not disclose the special combination of features defined in the invention and D1-D2 are therefore now reconsidered to only represent prior art.

According to the invention, a highly electroconductive layer is formed on at least one end of the support bar made of aluminium, by coating the lower surface of the aluminium end of the bar, i.e. the contact surface, with silver or silver alloy. The highly electroconductive coating material forms a metallurgical bond with the aluminium support bar.

It is not considered obvious to a person skilled in the art to modify the known methods or bars in D1 or D2 so as to obtain a method or support bar such as the ones claimed in the invention.

Therefore, the invention according to claims 1-18 is novel, considered to involve an inventive step and has industrial applicability.

PATENT CLAIMS

1. A method for the formation of a good contact surface on a support bar of an electrode used in electrolysis, where an electrode plate is immersed in the electrolysis cell and a plate support bar is supported by its ends on the edges of the electrolysis cell so that the highly electroconductive end is held on a busbar, **characterised in that** a highly electroconductive layer is formed on at least one end of the support bar made of aluminium by coating the lower surface of the aluminium end of the bar, i.e. the contact surface, with silver or silver alloy and the highly electroconductive coating material forms a metallurgical bond with the aluminium support bar.  
5
2. A method according to claim 1, **characterised in that** the silver alloy is silver-copper.  
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3. A method according to claim 1, **characterised in that** the highly electroconductive coating layer is formed of two layers having a transmission layer between them wherein the first layer is copper and the second silver or silver alloy, the transmission layer being tin or tin-dominate alloy.  
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4. A method according to any of claims 1- 3, **characterised in that** the support bar is equipped with a casing section made of some other material.  
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5. A method according to any of claims 1 - 4, **characterised in that** the highly electroconductive coating layer is formed using thermal spraying technique.  
30
6. A method according to claim 5, **characterised in that** the thermal spraying technique is based on gas combustion.

7. A method according to claim 5 or 6, **characterised in that** the thermal spraying technique is high velocity oxy-fuel spraying.
- 5 8. A method according to any of claims 1 - 7, **characterised in that** the highly electroconductive coating material is in powder form.
9. A method according to claim 5 or 6, **characterised in that** the thermal spraying technique is flame spraying.
- 10 10. A method according to any of claims 1 – 6 or 9, **characterised in that** the highly electroconductive coating material is in wire form.
- 15 11. A method according to claim 3, **characterised in that** the first layer is formed by thermal spraying technique and the second by soldering.
- 20 12. A method according to any of claims 1 – 11, **characterised in that** at least one end of the aluminium support bar is furnished on the lower surface with a notch, and that the notch area is coated with a highly electroconductive material.
- 25 13. A support bar for an electrode used in electrolysis, where a plate section of the electrode is meant to be immersed in an electrolysis cell and a support bar to be supported by its ends on the edges of the electrolysis cell, **characterised in that** the area on the lower surface of the end of the aluminium support bar, i.e. the contact surface, is coated with a highly electroconductive coating layer being silver or silver alloy and that highly electroconductive coating material has formed a metallurgical bond with the aluminium support bar.
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14. A support bar according to claim 13, **characterised in that** the silver alloy is silver-copper.
- 5 15. A support bar according to claim 13, **characterised in that** the highly electroconductive coating layer is formed of copper and silver with a transmission layer between them.
- 10 16. A support bar according to any of claims 13 - 15, **characterised in that** the support bar is equipped with a casing section made of some other material.
- 15 17. A support bar according to any of claims 13 - 16, **characterised in that** the highly electroconductive coating layer is formed using thermal spraying technique.
- 20 18. A support bar according to claim 15, **characterised in that** the highly electroconductive coating layer is formed using thermal spraying technique and soldering.